

Student Workbook

California Education and the Environment Initiative

B

Biology Standard
B.8.b.



Biological Diversity: The World's Riches

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency
California Natural Resources Agency
Office of the Secretary of Education
California State Board of Education
California Department of Education
California Integrated Waste Management Board

Key Leadership for the Education and Environment Initiative:

Linda Adams, Secretary, California Environmental Protection Agency
Patty Zwarts, Deputy Secretary for Policy and Legislation, California Environmental Protection Agency
Andrea Lewis, Assistant Secretary for Education and Quality Programs, California Environmental Protection Agency
Mark Leary, Executive Director, California Integrated Waste Management Board
Mindy Fox, Director, Office of Education and the Environment, California Integrated Waste Management Board

Key Partners:

Special thanks to **Heal the Bay**, sponsor of the EEI law, for their partnership and participation in reviewing portions of the EEI curriculum.

Valuable assistance with maps, photos, videos and design was provided by the **National Geographic Society** under a contract with the State of California.

Office of Education and the Environment

1001 I Street • Sacramento, California 95812 • (916) 341-6769
<http://www.calepa.ca.gov/Education/EEI/>

© Copyright 2010 by the State of California
All rights reserved.

This publication, or parts thereof, may not be used or reproduced without permission from the
Office of Education and the Environment.

These materials may be reproduced by teachers for educational purposes.



Lesson 1 **Earth's Rich Biodiversity**

Key Unit Vocabulary	2
Worldwide Biodiversity	3

Lesson 2 **Levels of Biological Diversity**

Levels of Biodiversity	5
Species Diversity in Different Biomes	7
Diversity in the Redwoods	11

Lesson 3 **Responses to Change**

Events and Practices That Affect Rainforests	13
Capacity to Adjust	15

Lesson 4 **Surviving Environmental Change**

Biological Diversity: A Factor in Species Survival	19
----------------------------------------------------------	----

Key Unit Vocabulary

Lesson 1

Biodiversity hotspot: A region containing at least 1,500 endemic species of vascular plants that has lost 70% of its original habitat, making it a priority for conservation efforts.

Biological diversity (biodiversity): A measure of the number of different species of organisms in a specific area, it is also used as a general description of species richness, ecosystem complexity, and genetic variation.

Biome: Large regions of Earth's surface that share similar characteristics of climate and vegetation.

Ecosystem: A specific area, such as a kelp forest, that contains a characteristic set of interdependent species that interact with each other and the abiotic components found there.

Ecosystem services: The functions and processes that occur in natural systems, such as pollination, that support or produce ecosystem goods and help sustain human life, economies, and cultures.

Endemic species: A species that is present in and limited to a particular region.

Estuary: A coastal body of water created where the mouth of a river empties into the ocean or a bay and mixes with salt water.

Gene pool: The set of genetic information that collectively defines a species or a population.

Genotype: The genetic makeup of an organism.

Geographic extent: The area through which a species or ecosystem is distributed.

Habitat: The environment in which an organism lives and meets its needs.

Microclimate: A localized climatic condition that differs from the general surroundings due to the local conditions.

Microhabitat: A small and specialized habitat, such as a crevices in caves and undersides of logs, occupied by a species.

Natural system: The interacting components, processes, and cycles within an environment, as well as the interactions among organisms and their environment.

Niche: A description of how a species functions within an ecosystem, such as the types and sizes of foods eaten and the specific habitats occupied.

Primary production: The amount of new organic material that is synthesized through photosynthesis and chemosynthesis, and is available to organisms in an ecosystem.

Range: The entire region in which an organism or ecosystem is naturally found.

Resource extraction: The removal of a natural resource from an area by human practices, such as logging and mining.

Territory: The area that an animal defends that contains a nest, den, or mating site, and food resources.

Topography: The physical features of the land, such as elevation and relative location.

Name: _____

Instructions: Use information from this lesson to answer the following questions. (5 points each)

1. What did you observe about the diversity of California's ecosystems as you looked at the **Biological Diversity** wall map?

2. Why is California considered a biodiversity hotspot?

3. What have you observed about the distribution of biomes around the world?

4. As you compare the number of biomes with the number of vegetation types and ecosystems in California, what can you conclude about biological diversity in California?

Name: _____

5. According to the **Diversity of Life** wall map, what biome can be found in North America, South America, Africa, Asia, and Australia?

6. What characteristics common to many of California's ecosystems lead to the state's high biological diversity?

Levels of Biodiversity

Lesson 2 | page 1 of 2

Name: _____

Part 1

Instructions: Describe and compare the three deserts by completing the following chart. (1 point per cell)

	Great Basin	Mojave	Sonoran
Precipitation (Amount and Patterns)			
Climate (Degrees and Patterns)			
Location (Elevation and Latitude)			
Plants and Animals (Variety and Distribution)			

Name: _____

Part 2

Instructions: Use the chart in Part 1 to compare the three deserts and answer the following questions.

1. Can deserts have varying levels of biological diversity? Explain, using the Sonoran, Mojave, and Great Basin deserts as examples. (3 points)

2. Which of these three deserts has the highest biological diversity? Explain your answer. (2 points)

3. What factors lead to higher levels of biological diversity in desert ecosystems? (3 points)

Species Diversity in Different Biomes

Lesson 2 | page 1 of 4

Name: _____

Part 1

Instructions: The grids on pages 1 and 2 show where and how many different species live in the same size area in two different biomes, a desert and a tropical rainforest. The letters in the plots within each grid represent different species living in the area. For example, “A” might represent a cholla cactus and “B” might represent a kangaroo rat. Analyze the species data in all the plots and complete the data summaries below the charts on pages 1 and 2. Use the data on these grids to answer the questions on pages 3 and 4.

Desert			
Plot 1 A, B, C, D, E, F, G	Plot 2 A, B, C, D, E, F, G, H, I	Plot 3 A, B, C, D, E, F, G, H, I	Plot 4 A, B, C, D, E, F, G, H, I
Plot 5 A, B, C, D, E, F, G	Plot 6 A, B, C, D, E, F, G, H, I	Plot 7 A, B, C, D, E, F, G, H, I	Plot 8 A, B, C, D, E, F, G, H, I
Plot 9 A, B, C, D, E, F, G	Plot 10 A, B, C, D, E, F, G, H, I	Plot 11 A, B, C, D, E, F, G, H, I	Plot 12 A, B, C, D, E, F, G, H, I
Plot 13 A, B, C, D, E, F, G, H, I	Plot 14 D, E, F, G, H, I	Plot 15 A, B, C, D, E, F, G, H, I	Plot 16 A, B, C, D, E, F, G, H, I

How many total species are found in the 16 desert plots? _____

How many plots is each species found in?

A = _____ B = _____ C = _____

D = _____ E = _____ F = _____

G = _____ H = _____ I = _____

Species Diversity in Different Biomes

Lesson 2 | page 2 of 4

Name: _____

Tropical Rainforest			
Plot 1 AA, BB, CC, DD, EE, FF, GG, HH, II, JJ, KK	Plot 2 AA, CC, DD, EE, FF, GG, HH, II, JJ, KK, LL, MM, NN	Plot 3 EE, FF, GG, HH, II, JJ, KK, LL, MM, NN, OO, PP, QQ, RR	Plot 4 AA, CC, DD, FF, HH, II, KK
Plot 5 II, JJ, KK	Plot 6 CC, II, JJ, KK, LL, MM, OO, QQ	Plot 7 FF, GG, HH, II, JJ, LL, MM, NN, OO, PP, QQ, RR, SS, TT	Plot 8 DD, FF, HH, II, SS, TT
Plot 9 II, JJ, KK, LL	Plot 10 II, JJ, KK, LL, MM, NN, OO, PP, QQ, RR, SS, TT, UU	Plot 11 DD, II, PP, RR, SS	Plot 12 DD, FF, II, KK
Plot 13 AA, BB, CC	Plot 14 AA, CC, DD, EE, FF, GG, HH, II, JJ, KK	Plot 15 GG, HH, II, JJ, KK	Plot 16 DD, FF, HH, II, SS, TT

How many total species are found in the 16 rainforest plots? _____

How many plots is each species found in?

AA = _____	BB = _____	CC = _____
DD = _____	EE = _____	FF = _____
GG = _____	HH = _____	II = _____
JJ = _____	KK = _____	LL = _____
MM = _____	NN = _____	OO = _____
PP = _____	QQ = _____	RR = _____
SS = _____	TT = _____	UU = _____

Species Diversity in Different Biomes

Lesson 2 | page 3 of 4

Name: _____

Part 2

Instructions: Answer the following questions in the spaces provided.

1. Which of these two biomes has greater biodiversity? How do you know?

2. Which species in the tropical rainforest has the greatest geographic extent (broadest distribution)? Explain your reasoning.

3. Which species in either biome has the smallest geographic extent (distribution)? Which biome does it live in? Explain your reasoning.

4. How does the species distribution differ between the two biomes?

Species Diversity in Different Biomes

Name: _____

5. Why does the species distribution differ between these two biomes?

6. What can you conclude about the biological diversity of ecosystems within these two biomes?
(Be prepared to explain your answer to the rest of the class.)

Diversity in the Redwoods

Lesson 2 | page 1 of 2

Name: _____

Instructions: The grid below shows where and how many different species live in a study area in the redwood forest, a temperate coniferous forest biome. This study area is the same size as the desert and rainforest study areas. The letters in the plots within each grid represent different species living in the area. For example, “AAA” might represent a giant sequoia and “BBB” might represent a banana slug. Analyze the species data in the plots and complete the data summary below the chart. Use the data on these grids to answer the questions on page 2.

Redwood Forest			
Plot 1 AAA, BBB, CCC, DDD, EEE, FFF, GGG, HHH	Plot 2 AAA, CCC, DDD, EEE, FFF, GGG, HHH, III, JJJ	Plot 3 AAA, CCC, DDD, FFF, HHH, III, KKK	Plot 4 AAA, CCC, DDD, FFF, HHH, III, KKK
Plot 5 AAA, BBB, III, JJJ, KKK, NNN, OOO	Plot 6 FFF, GGG, HHH, III, JJJ, KKK, LLL, MMM, OOO	Plot 7 FFF, GGG, HHH, III, JJJ, LLL, MMM, NNN, OOO	Plot 8 EEE, FFF, III, JJJ, KKK, LLL, MMM, NNN, OOO
Plot 9 AAA, BBB, III, JJJ, KKK, LLL	Plot 10 III, JJJ, KKK, LLL, MMM, NNN, OOO	Plot 11 AAA, BBB, DDD, III, NNN, OOO	Plot 12 DDD, FFF, III, KKK, NNN, OOO
Plot 13 AAA, BBB, CCC, FFF, GGG, III, JJJ, KKK	Plot 14 AAA, CCC, DDD, EEE, FFF, GGG, HHH	Plot 15 GGG, HHH, III, JJJ, KKK, MMM, NNN	Plot 16 DDD, FFF, HHH, III, NNN, OOO

How many total species are found in the 16 redwood forest plots? _____

How many plots is each species found in?

AAA = _____	BBB = _____	CCC = _____
DDD = _____	EEE = _____	FFF = _____
GGG = _____	HHH = _____	III = _____
JJJ = _____	KKK = _____	LLL = _____
MMM = _____	NNN = _____	OOO = _____

Diversity in the Redwoods

Lesson 2 | page 2 of 2

Name: _____

1. Compare the species distribution in the redwood forest to that of the desert and tropical rainforest biomes. List the biomes in order by level of biological diversity. (1 point each)

Lowest: _____

Midlevel: _____

Highest: _____

2. Explain how you decided on this order. (3 points)

3. Why are tropical rainforest biomes considered to have high levels of biological diversity? (3 points)

4. Why do the geographic extent and biological diversity of ecosystems vary in different biomes? (4 points)

Events and Practices That Affect Rainforests

Lesson 3 | page 1 of 2

Name: _____

Instructions: Complete the following chart during class discussion.

Natural Event or Human Practice	Description	Effects on Natural System	Effects on Species Composition	Effects on Local Geographical Extent of Rainforest
Tropical Storm				
Drought				

Events and Practices That Affect Rainforests

Name: _____

Natural Event or Human Practice	Description	Effects on Natural System	Effects on Species Composition	Effects on Local Geographical Extent of Rainforest
Farming				
Logging				
Mining				

Capacity to Adjust

Lesson 3 | page 1 of 4

Name: _____

Part 1

Instructions: Complete the following chart during class discussion.

Natural Event/ Human Practice	Scope (Local, regional, or national)	Scale Small-scale (tens to hundreds of acres), large-scale (thousands of acres)	Duration Length of time (short-term, ongoing, indefinite)	Byproducts or Effects	Recovery or Capacity to Adjust
Tropical Storm					
Drought					

Capacity to Adjust

Lesson 3 | page 2 of 4

Name: _____

Natural Event/ Human Practice	Scope (Local, regional, or national)	Scale Small-scale (tens to hundreds of acres), large-scale (thousands of acres)	Duration Length of time (short-term, ongoing, indefinite)	Byproducts or Effects	Recovery or Capacity to Adjust
Farming					
Logging					
Mining					

Name: _____

Part 2

Instructions: Use examples from **Events and Practices That Affect Rainforests** on pages 13–14 and your work in Part 1 to answer the following questions.

1. How do natural events and human practices influence the local geographic extent of rainforest ecosystems? (5 points)

2. How do natural events and human practices affect the species composition of rainforests? (5 points)

Lesson 3 | page 4 of 4

3. Describe one natural event and one human practice discussed in this lesson. Explain which of the two affords rainforest ecosystems a better chance of recovery. (10 points)

[illegible]

Biological Diversity: A Factor in Species Survival

Lesson 4 | page 1 of 2

Name: _____

Instructions: Use information from **Kingfisher Background Information** (Student Edition, pages 9–11) to answer the questions below. (5 points each)

1. What is the correlation between the size of a kingfisher and the size of fish it eats?

2. What types of human activity could cause a major environmental change that could affect kingfishers?

3. A human practice has eliminated all fish of a particular size needed by the Amazon kingfisher.
a. What happens to this species of kingfisher?

- b. How many kingfisher species remain?

- c. What happens to the overall range of characteristics and adaptations (gene pool) of kingfishers in this ecosystem?

4. A human practice has eliminated all fish of the size needed by the belted kingfisher.
a. What happens to this species of kingfisher?

- b. How many species of kingfisher remain in this ecosystem?

- c. What happens to the gene pool of kingfishers in this ecosystem?

Biological Diversity: A Factor in Species Survival

Lesson 4 | page 2 of 2

Name: _____

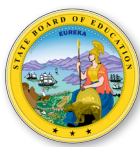
5. In which natural system, the rainforest of Panama or the North American woodland, is there a better chance that some species of kingfishers will survive major changes in the environment?

Why?

Instructions: Answer the following question after the class discussion.

6. Which biomes on Earth are being affected by human practices?

Why?



California STATE BOARD OF
EDUCATION

California Education and the Environment Initiative